Industrial Partnership Prosperity Game^{TM} Players' Handbook

Prosperity Games^{TM}

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Sandia National Laboratories

Industrial Partnership Prosperity Game^{TM}

Players' Handbook

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The Game

Prosperity Games^{TM}

Prosperity Games^{TM} were adapted from strategic war games to simulate current realities and possible alternative futures as influenced by executive-level decisions. Prosperity Games^{TM} are about leadership and strategy development. They provide a high-level interactive simulation that models the complex world of values, propositions, and persuasion. They are not people playing against a computer.

The environment engendered in every Prosperity Game^{TM} serves to meet a set of general objectives simply by participation in the simulation process itself. These objectives include:

GENERAL OBJECTIVES:
- Develop partnerships, teamwork, and a spirit of cooperation among industry, government, university, and public stakeholders.
- Increase awareness of the needs, desires and motivations of the different stakeholders.
- Bring conflict into the open and manage it productively.
- Explore long-term strategies and policies.
- Provide input for possible future legislation.
- Stimulate thinking.
- Provide a major learning experience.

The players involved in a Prosperity Games^{TM} simulation represent a wide range of different interests and often have different views on key issues. Each participant is responsible for representing his or her team's "real life" constituency. The format of the Prosperity Games^{TM} allows the viewpoints of the different teams' constituencies to be understood in small groups and synthesized into a working consensus – one which all parties can support, even if it is not the optimum for a particular interest group.

Prosperity Game^{TM} play takes place in an open environment that features the processes of planning and negotiation. A game typically compresses five to ten years of real time into two days of play. Players control the content of the games and generate their own strate-

gies and goals or objectives, which are one of the major outputs of the game. High-level players create new insights and options that often develop into post-game opportunities. Teams are designed to provide sufficient knowledge and judgment necessary to make decisions as well as to contain the diversity needed to create stimulating and engaging interactions.

Prosperity Games^{TM} are viscerally engaging. This serves to generate enthusiasm and commitment, and to bring conflict into the open in a safe environment where it can be managed productively. The Prosperity Game^{TM} simulation explores empathic and learning experiences, collaborative and competitive interactions, experimentation, decision making, and innovation. Players who fully engage in the process of creating a constructed reality and in testing each other's ideas benefit the most. The games are so interactive, fast paced, and complex that the few players who try to "game the game" are usually unsuccessful and disappointed.

A final debriefing allows the teams to share their experiences. The game experiences of the players are then collected, discussed, prioritized, and documented in a final report. This experiential process develops the relationships and provides the inputs and innovative thinking that will be used for follow-on activities and planning.

Industrial Partnership Prosperity Game^{TM} Objectives

The sponsors of this game are seeking to promote interactions among staff from Sandia and their current or potential partners from industry and government to explore the partnership process. These interactions will provide participants with a chance to understand different facets of partnerships and explore how they can be used and improved to produce win-win results. It will be an invaluable learning experience that can create exciting *alternative* futures as well as explore the current *real* world.

This Prosperity Game^{TM} is designed to accomplish the following specific objectives:

SPECIFIC OBJECTIVES:
- Explore ways to increase industry partnerships to meet long-term Sandia goals.
- Improve Sandia business development and marketing strategies and tactics.
- Improve the process by which Sandia develops long-term strategic alliances.

These objectives will be met by the players and teams acting separately and in concert to explore the future through the development and implementation of their own strategies.

Partnership Game Concept

Scenario:

This game begins in the present and simulates the next eight years. The setting is the current state with regard to partnering at and with Sandia National Laboratories at the end of FY97. Several conditions prevail that suggest the need for change. Federal funding for research has dropped more than 3% in real terms in the last three years. The forecast in the President's proposed budget is an additional 14% decline in R&D over the next five years. With the reduction of the threat of nuclear war, national priorities are changing, and the labs' role in these is not clear. Some are calling for downsizing the federal laboratories, both in terms of their number and size. Furthermore, some in industry view federal laboratories as difficult to partner with. This simulation seeks to explore the role of partnerships in the face of these and similar challenges.

To meet the objectives of the Industrial Partnership Prosperity Game^{TM}, stakeholders have been categorized into four groups:

STAKEHOLDER GROUPS:
- Sandia Staff
- Agreements/Administration
- Industry
- Rest of the World

The central theme of the game is the relationship among all the stakeholders in the competition for scarce public and private resources and how they can be used to create the most progress. The labs are concerned about maintaining core capabilities to meet their government-mandated missions. Industry is concerned about the allocation of resources to fund ongoing company operations versus future investments. All stakeholders would like to have metrics to evaluate the success or failure of previous decisions and to help guide future decisions.

In order for this simulation to adequately represent the wide range of different interests and to stimulate interaction, the five stakeholder groups have been further subdivided into 13 teams. Team designations within these groups are illustrated in Figure 1 and are discussed below.

Organization and role assignments within the teams to accomplish the tasks "at hand" are the responsibility of the players assigned to each team (e.g., leaders, negotiators, decision-makers, "home-basers," recorders, advocates, etc.). Each team will be assigned process managers (game staff) to facilitate team interactions, provide process guidance, capture information, and flag upcoming deadlines.

The Sandia and DOE interests have been allocated among seven teams. Four of the seven teams are aligned with the four 'whats' of Sandia's strategic plan.
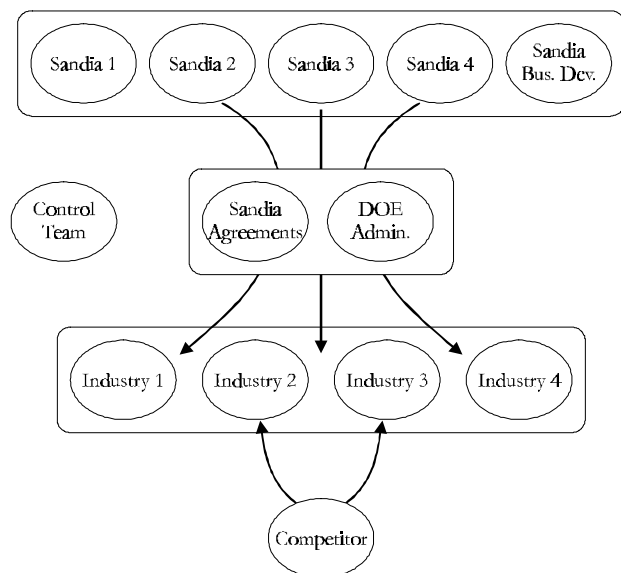

Figure 1. Industrial Partnership Prosperity Game^{TM} Teams.

Two Sandia teams represent the business development, marketing, intellectual property, licensing, agreements and related functions. The DOE team represents the DOE interest and requirements in the partnership process.

SANDIA STAFF TEAMS:
- Sandia Staff 1 (nuclear weapons, stockpile stewardship, deterrence, nonproliferation)
- Sandia Staff 2 (other weapons, threat reduction, other nuclear incidents)
- Sandia Staff 3 (energy, environment, critical infrastructure surety)
- Sandia Staff 4 (emerging national security threats, terrorism, military, space, etc.)
- Sandia Business Development (including marketing)

AGREEMENTS/ADMINISTRATION TEAMS:
- Sandia Agreements (licensing, intellectual property, patents, contracts, etc.)
- DOE Administration

These seven teams work together to produce partnerships and agreements from the Sandia side.

Industry is represented by four teams.

INDUSTRY TEAMS:
- Information Technology and Computing
- Energy, Environment, and Transportation
- Advanced Manufacturing and Materials
- National Security and Criminal Justice

Each industry team represents a defined group of companies and will be given R&D resources to help them reach their goals. Industry teams may partner with each other, the Sandia teams, or a Competitor team. More information is given in the section on team-specific information.

The REST OF THE WORLD is represented by two teams:
- Competitor team
- Control team

The Competitor Team represents competitors (or in some cases, potential partners) to Sandia for industrial partnerships. These competitors include other federal laboratories and universities. Although these entities can in many cases be partners themselves, this game focuses on industrial partnerships. The primary role for the competitor team is thus to compete with Sandia, and provide incentives for the Sandia teams to improve their partnership processes and relationships.

Finally, the Control Team is primarily responsible for conducting the game, including polling, game play support simulations, agreement evaluations, publications, etc. It is also responsible for resolving all disputes, and for playing all other roles and functions not otherwise assigned that may arise during the game (e.g., Congress).

Team players are expected to remain faithful to their assigned roles by protecting the interests of their constituents. Further team descriptions have also been provided (see appendices) to help stimulate thinking and provide a common but non-exclusive setting for players to base their planning on. This information, coupled with the experience and expertise of the players, launches them into the real-world simulation of the game. Teams are encouraged to draw upon their own resources (players) and others to accomplish their goals.

Players:

Players are assigned to one of the stakeholder teams. This exploration requires highly skilled players with a strong knowledge of their business assets and needs, and the confidence to make decisions, observe their consequences, and alter their decisions accordingly. The players must also be self-starters who are highly motivated to work toward perceived goals. Their creativity and commitment to the simulation determine the success of the game. A list of the players and their team assignments will be provided prior to the game.

Game Play:

Pre-game – Every player should come to the Prosperity Game^{TM} having read the handbook completely, and having a working knowledge of the issues confronting his or her team. This allows each team to use the game time in the most effective way, and allows each player to be an effective contributor to the team.

Planning – Every Prosperity Game^{TM} is unique because the outcomes depend upon the players. In

Prosperity Games^{TM}, the players own the final content of the game. Thus, the most critical element in any game is for each team to clearly decide upon a course of action and document it in a plan.

Additional information is given for each team in the section on team-specific information. This includes some potential challenges posed in the form of current conditions. In addition, to stimulate your thinking, we have included three technical briefs in a separate section. These briefs were introduced and discussed at a recent meeting[1] of the National Coalition for Research and Development (NCRD). Please consider these or other technology areas in which you have expertise and in which partnerships can be mutually beneficial. These briefs are provided for background and convenience only, and are not intended to direct the play of the game. Teams should review this information prior to forming their plan, but are not under any obligation to use it. After a review of the data and challenges, *the players are responsible for developing team strategies for the game* that, based upon their expertise, will best meet the interests of their constituents. These strategies may include a selected and modified subset of the given challenges, or they may be based on something different. The actual strategies selected and pursued by the players during the game will determine the game outcome. The interplay of the different teams and players (through the options, agreements and partnerships that they pursue) will then provide information as to how partnerships are best formed and strengthened. A copy of all strategic plans, including goals and milestones, is a deliverable to the Control Team at the close of planning session. This should be done electronically using a game E-mail system that will be available at each team table.

Basic moves – The game has few rules. Team members play their roles by negotiating and interacting with each other and with other teams. Teams develop plans to further their goals, and form partnerships with other teams to meet their goals. New policies and processes may also be proposed and put into action as they would be in real life. *In general, if the rules do not specifically preclude what you wish to do, try it or ask the Control Team for clarification. Also, if you wish to do things that are outside of where you perceive the game boundaries to be, please talk to the Control Team. The game is very flexible.*

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1.   Atlanta, GA, June 24, 1997.

Game play utilizes an "agreement" as the one basic "move" which players use as a means to pursue their strategies and objectives, and alter the future accordingly. In the context of the game, most long-duration events (such as building new facilities) can be assumed to have already been accomplished in the event of a successful move.

Agreements – The "agreement" move in the game is a completed contract which represents investment decisions and inter-team agreements. The agreement move replicates real-life activities, including negotiations, consensus building, resource allocation, and contracting, between stakeholders. Agreements must contain an exchange of value for value. These decisions or agreements are recorded on standard agreement forms.

Agreements between multiple teams or players must describe the value received, include any required resources, and be approved and signed by each negotiating party. Agreements made by industry with the Sandia teams must involve the *Sandia Agreements Team* with *DOE Administration Team* approval as required. Agreements made by the *Competitor Team* operating as a federal laboratory must also go through the *Agreements* and *DOE Teams* to simulate real-life processes. All agreements must also be submitted to the Control Team for final acceptance and approval. The Control Team may require changes to any agreement based on an overall game perspective. Pricing (in terms of chits) of the agreement will also be done by the Control Team. Process and policy changes may be made by those who would have similar authority in real life, subject to the approval of the Control Team.

The most important test for any move (action, agreement, contract, partnership) is its reasonableness evaluated from the perspective of the real world. This test does not discriminate against creative or innovative thinking, but is intended to discriminate against fantasy. Open negotiation sessions should produce agreements that are based on quality, valid negotiations, and partnering or strategic alliances.

The concept of resource scarcity will be modeled by introducing chits (a substitute for money) into each session. Teams will receive chits to be used in pursuing their strategies and objectives. Since chits will be relatively scarce, it may be to a team's advantage to partner. Teams reluctant to pursue alliances or partnering to

create agreements may find themselves isolated and ineffective in making any progress toward their strategic objectives.

Electronic communication – Laptop computers that have been linked together to form a game intra-net will be available at each team table. This intra-net has both E-mail and web features. This system has several purposes in the game:

- planning summaries and agreements should be sent to the Control Team by E-mail,
- teams may communicate with each other by E-mail as well as in person,
- information sent to the Control Team will be posted on a 'Game Web' which can be accessed by any of the computers on the network, and
- players will be asked to give their responses to polling questions on the 'Game Web.'

Polling will occur at the beginning, middle, and end of the Prosperity Game^{TM}. Each player should complete the entry poll at their team table immediately after arriving at the game. Specific instructions will be available at the game.

Other moves – **disputes and lawsuits**. All disputes will be resolved by the Control team, whose decisions are binding. Lawsuits can be filed at any time by any team. An odd number (at least three) of judges must hear the case. After both sides have presented their arguments, the judges decide by majority rule. Judges' decisions are final and binding. Litigants must appear before the judges at their scheduled times. If one litigant is one minute late, a judgment will be immediately rendered in favor of the litigant who is present. If both litigants are five minutes late, the case will be dismissed; the litigants will need to reschedule their court times.

Schedules and appointments – It is essential that all players strictly follow the agenda and be on time for their appointments. Penalties can be assessed for players or teams that are late.

Proprietary data - The purpose of this game is to explore and refine the partnership process. Therefore, any data that would not be shared in the initial talks between companies in real life should not be shared in this setting. Information exchanged during the game may be published in game proceedings.

Commitments in the game context - All commitments, written or verbal, made while the game is in progress (including evenings away from active game play) should be considered by all players to be "game moves," and not binding outside the game. However, players are encouraged to pursue real partnerships after the game that are based on relationships formed during the game.

Winning the game – The game is "won" by successfully meeting the challenges and objectives embraced by one's team. Another form of "winning" is in the experience and relationships that one forms and carries away from the game. Circumventing or "gaming the game" is not winning, desirable, or of benefit to the other players. Players should seek to accomplish their goals by following the most realistic alternatives available within the constraints of the simulation. The most successful moves will be those that are consistent with the established team strategy.

In most of the games conducted, we've observed that a small number of players (about 5%) have difficulty with the simulation environment. This usually takes the form of attacking the game format and rules (either during or after the game), or disparaging and demeaning the contributions of other players. These attacks tend to reduce the productivity and enthusiasm of the teams affected. If you find yourself with any of these feelings, please discuss the situation with the Control Team.

Emotional player bias is a natural product of stakeholder interests and perceptions or paradigms and is, therefore, an important ingredient of the game. Emotions fuel and motivate players. The game process can elicit deep emotions. The surfacing of deep-seated stakeholder agendas and key areas of stakeholder protection into game play – wherein they can be further articulated and discussed in a safe environment – can result in a new consensus where all stakeholders benefit from newly formulated strategies relevant to real world situations. **This constitutes the real win.**

Game Scoring:

Several forms of assessment will occur during the game. At two or three junctures, the players will assess the play of groups of teams. Teams will also assess

themselves against how well they met their stated objectives and the perceived impact they made on the future. And finally, they will be assessed by the Prosperity Games^{TM} staff on the basis of their impact on the partnership process.

Partnership Game Schedule

This Prosperity Game^{TM} includes an orientation followed by seven sessions that define the play. A summary of the play is provided on the inside of the back cover. A detailed game schedule is provided on the back cover. The play runs from the present to the end of 2005. On the basis of play times, this represents a compression ratio in excess of 1250:1 (2 game minutes ~ 1 business week). This naturally means that many aspects and issues will be treated very approximately.

Session 1: Planning and Strategy

This session focuses on strategic planning and organizing your team to best deal with the coming events. Teams will decide on ground rules for making decisions, who will play what roles on the team, assign responsibilities, and initiate processes for accountability and correcting errors. Outstanding questions about the game should be resolved at this time. Teams will review their current states and decide where they would like to be in the year 2005. Players will discuss the challenges provided in this handbook and modify or supplement them with others of their choosing and prioritize the list. Additional details about what is expected from each team during this planning session are given in the team-specific information section. Each team should also select one player to brief the game on their plans.

Midway through this planning session, all teams will gather together and present their initial plans in a plenary session. These presentations should be limited to three minutes each, and are intended as a way to spread game information very quickly. After the briefing, teams should return to their tables to finish planning, modifying their plans based on what they have learned from other teams if necessary. Team challenges, goals and milestones must be submitted electronically to the Control Team at the close of this session. Any updates to the goals and milestones during the game should also be submitted to the Control Team.

Session 2: Open Negotiation

Teams will receive a distribution of resources (chits) at this time. These resources are generally used to 'pay' for the work done in the game, but can be used in any way the team chooses. Teams should use the time in this session to pursue actions, build partnerships or implement process or policy changes that will meet the goals and objectives they outlined in the planning session. Teams should also be continually engaged in intelligence gathering, as keeping abreast of the information in the game will provide them with more options in meeting their goals. As information becomes available, teams may wish to update their plans. Although a team's high-level objectives should remain fixed, the strategies used to reach those objectives may change with changing information. A robust plan will allow for this kind of flexibility.

All "moves" must be documented on an agreement form. Any costs involved in paying for these moves will be done with chits. Note that the real-life signoff process for any agreement must be followed. For example, a CRADA must undergo the necessary legal and intellectual property reviews, among other things. Some agreements may require DOE approvals or waivers. These parts of the process must be represented in the game agreements. Any changes in these processes will be implemented into the game and followed from that time forward.

Following this session, the *Sandia Business Development Team* will present their key observations of the game play up until that time.

Session 3: Open Negotiation

Teams will receive additional resources to continue their partnering efforts. Teams should continue to pursue their strategies through partnering and policy and procedure changes. Following this session, the *Sandia Agreements Team* will present their key observations of the game play up until that time.

Session 4: Team Debriefing

A debriefing meeting will be held to start the final day's play. For this session each team will meet and answer

several questions based on the previous days' play. Each team (with the exception of the *Sandia Business Development* and *Agreements Teams* that already had their turn) should then select one player to present its answers to the group. The Control Team will moderate the session.

Session 5: Open Negotiation

In past games, the briefing session has often served as a transition point. After a full day of planning and negotiation, the debriefing gives all players additional perspective on parts of game play of which they were previously unaware. This often stimulates a flood of new ideas and enthusiasm.

Active play will resume with the allocation of additional resources. Each team should briefly review its planning document for possible revision based on previous play and the results of the debriefing. All updates are to be submitted to the Control Team by the close of this session. Play should continue as in sessions 2 and 3 though the use of partnerships and other positive changes that build on earlier successes.

Following this session, the *Sandia Business Development Team* will present their key observations of the game play up until that time.

Session 6: Open Negotiation

Teams will receive additional resources to continue their partnering efforts. Teams should continue to pursue their strategies through partnering and policy and procedure changes. Following this session, the *Sandia Agreements Team* will present their key observations of the game play up until that time.

Session 7: Final Debriefing

The final game session is a debriefing in which facilitators will collect the observations of their teams, and deliver the results to the Control Team. The debriefing should address: (1) how well the team met its specific goals and milestones; (2) what impact the team had on the Sandia partnership process; (3) speculation on the future state of the labs, industry, and DOE based on overall game play; (4) suggested process improvements

for real-life implementation; and (5) discussion of potential follow-on activities. Between the time that lunch starts and the end of this session, all players should complete the web-based exit poll, and give feedback on the evaluation form that will be handed out. The session will conclude with a town meeting during which any player may respond to questions posed by the Control Team and others.

Partnering at Sandia

Sandia's strategy for participating in collaborative research and development agreements with private-sector partners has been evolving since 1991 when we began implementing the National Competitiveness Technology Transfer Act of 1989. Guided by that legislation, Sandia's initial strategy for partnering was to seek cooperative research and development agreements with individual companies. Such alliances target major national technology goals by focusing on generic, precompetitive research that can be broadly useful to an entire industry. Under the new legislation, Sandia's primary goal was to make measurable contributions to the global technology leadership of US industry by transferring Sandia-developed technologies to industry. As Sandia subsequently developed the largest portfolio of partnerships of any federally sponsored institution, our partnering strategy evolved beyond the simple transfer of technology to individual companies. We found that alliances involving industry, universities, and other laboratories were an excellent mechanism for advancing the technology of our mission requirements.[1]

Sandia has successfully conducted research in areas supporting national missions for almost 50 years. Having established a successful record in obtaining dual benefits, Sandia will move increasingly to partner, where appropriate, in these areas rather than do the work alone. To help us achieve continued success in our partnering activities during the next few years, the Technology Partnerships and Commercialization organization has established three important thrust areas: strategic partnerships, licensing and intellectual property, and regional economic development.[1]

The strategic partnerships thrust emphasizes long-term collaborations with industry, universities, state and local agencies, and foreign entities. Strategic partnerships are intended to support Sandia's traditional mission requirements by:[1]
- leveraging government funding in critical areas,
- sustaining and strengthening Sandia's scientific and

Figure 2. Sandia Forms Partnerships with Industry for Mutual Benefit.

technical excellence,
- accelerating technology development and deployment, and
- fostering closer relationships with industries critical to our primary missions.

Although Sandia recognizes that partnerships with all of the entities listed above are of great importance, this Prosperity Game[TM] is focused on industrial partnerships. Sandia partners with industry to develop a strong technology base for mutual benefit as shown in Figure 2. Such partnerships are structured to provide reciprocal benefits.

Benefits received by industry from the labs include:[2]
- validated computational modeling,
- materials and processing technology,
- major experimental facilities and diagnostics,
- highly educated, multidisciplinary staff working in a systems-engineering environment, and
- ability to protect proprietary information and to manage intellectual property.

Benefits received by the labs from industry include:[2]
- additional leading-edge technologies,
- identification of important technical problems by industry,
- expanded validation of computational modeling,
- enhanced relevance of the lab's science base,
- exciting new challenges to the lab staff, and
- building a broader constituency.

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1. Sandia National Laboratories Institutional Plan, Section 4.3, Future Thrusts. http://www.sandia.gov/ip/ch400001.htm

2. New Technology Week, Tuesday, Feb. 18, 1997, p. 9,11.

Technology partnerships and commercialization at Sandia, whether in the form of a partnership, license, entrepreneurial separation or a small business initiative, or regional action, operates under several guiding principles. These include providing for fairness of opportunity, ensuring that the action contributes to US competitiveness and to DOE mission impact, managing conflict of interest, protecting national security, and avoiding of competition with the private sector.

Partnership Process

The sharing of Sandia's technologies with the private sector is accomplished through formal agreements negotiated between Sandia and the individual partner. Some agreements have nonnegotiable terms and conditions, but even these agreements have a negotiated Statement of Work for each project. Developing partnerships requires discussion and negotiation. Deciding on the best agreement requires discussion among representatives from the Technology Partnerships and Commercialization Center (TPC), the line organization, and the industry partner.

The process for forming and executing a partnership varies somewhat with each individual agreement. However, a generalized picture of the process is shown in Figure 3. The idea for the partnership can originate in a variety of ways, and not all parts of the pictured process apply in all cases, but, in general, the flow of events is as shown. Negotiation and execution of an agreement include issues such as disposition of intellectual property, patent rights, etc.

One of the responsibilities of TPC is to determine which agreement type is appropriate for a given partnership. The pattern for this decision is shown in Figure 4.

Many times the discussions which ultimately lead to the development of other partnering activities (licenses, CRADA, NFE, WFO, and User facility agreements) are brought about as a direct result of the dialog established within the Technical Assistance program. The Small Business Initiative (SBI) technical assistance program is therefore a valuable tool to enhance the relationships necessary to foster the partnership environment.

There are many possible problems that could derail the partnership process. These can occur at any step along the way and include:
- the line organization is not clear about what they want to accomplish through the partnership,
- the line is clear about their expectations but has not communicated this effectively to the negotiators,
- the intellectual property (IP) is not owned by the line organization desiring the partnership,
- the IP is not owned by Sandia,
- the IP is encumbered by other agreements,
- the potential partner has already been selected outside of the required process,
- commitments have been made to a potential partner outside of the negotiation process,
- political relationships may encumber the process, and
- holding back information for potential personal gain, particularly with regard to entrepreneurial leave situations.

Many of these situations can be avoided if both the line and the TPC staff carry out their responsibilities. Line managers and staff have a responsibility to bring TPC into the process prior to any negotiation of business or legal terms and conditions. The line organizations are also responsible to avoid conflicts of interest (real or perceived) in all technology transfer activities. TPC is responsible for coordinating interactions, negotiation, ensuring that all requirements (legal and DOE) are met, and administering agreements once they are completed.

Licensing

While Sandia actively seeks industry partnerships to do joint research on common areas of interest, there are occasions where Sandia has intellectual property that can be used by industry without requiring further research. Licensing of technology permits Sandia to utilize its intellectual property to leverage industry participation in strategic alliances, to commercialize useful technology, and to generate revenue for new research.

TPC is responsible for all licensing negotiations. The licensing process includes the strategic review of intellectual property in conjunction with technical organizations and the licensing and patents organization. TPC is also responsible for identifying potential commercial applications, developing marketing and licensing strate-

gies, and ensuring that Sandia's strategic partnering needs are included in negotiated license agreements.

The licensing process at Sandia is as follows:
- the line organization identifies an interested partner, or a customer (industry) defines the technology they wish to license,
- additional information on the interested partner is gathered,
- status of the IP is determined,
- an intellectual property strategy is determined,

- a marketing and licensing strategy is determined,
- requestor(s) are qualified based on ability to commercialize or other factors,
- a draft agreement is negotiated and written,
- legal review and DOE review, if necessary,
- final agreement is signed.

User Facilities

Many of Sandia National Laboratories' unique research

SANDIA LINE   **TECH PARTNERSHIPS**   **INDUSTRY**

Idea about need or potential partnership may originate in any area.
Some preliminary discussion may occur between parties.

Query on:
   relevance to mission
   satisfies requirements
   establishes SNL capabilities
   status of technology
   IP ownership
   etc.

Gather information

Market research if needed

General announcement for Fairness of Opportunity

Interested companies respond

Receive inquiries

Qualify candidates
Narrow field

Query on:
   level of interest
   expectations, etc.

Communication on:
   statement of work
   cost, schedule,
   performance, etc.

Negotiate business terms and conditions
Ensure DOE req's satisfied
Determine agreement type

Execute agreement
Get approval signatures
Assign responsibilities

WORK and reporting

Track progress
Track reporting schedule
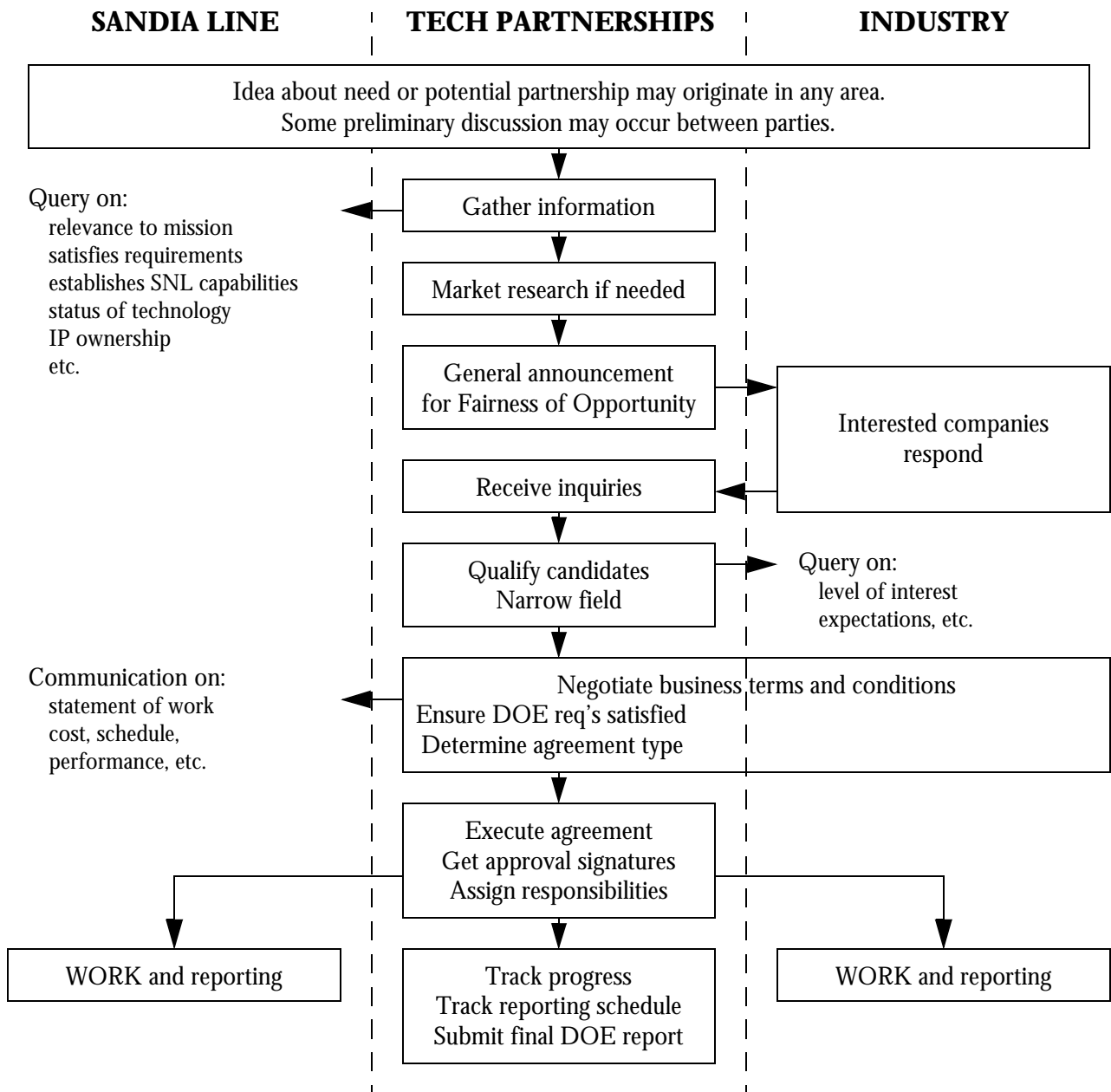Submit final DOE report

WORK and reporting

Figure 3. Partnership Process (not all parts apply to all partnerships).

facilities have been opened for use by private sector companies. Facilities open for public use are identified as Technology Deployment Centers or User Facilities. These consist of interrelated physical facilities, equipment, instrumentation, scientific expertise and necessary operational personnel. These facilities are available to US industry, universities, academia, other laboratories, state and local governments, and the scientific community in general. User Facilities are a unique set of scientific research capabilities and resources whose primary function is to satisfy Department of Energy (DOE) programmatic needs, while being accessible to outside users.

The current list of User Facilities that Sandia maintains includes:
- Advanced Battery Engineering Facility
- Center for Security Systems
- Combustion Research Facility
- Component Modeling and Characterization Facility
- Design, Evaluation and Test Technology Facility
- Electronic Technologies User Facility
- Electronics Quality/Reliability Center

- Engineering Sciences Experimental Facilities (ESEF)
- Explosive Components Facility
  - Shock Technology / Applied Research Facility (STAR)
- Flow Visualization and Processes Laboratory
- Geomechanics Laboratory
- Intelligent Systems and Robotics Center
- Ion Beam Materials Research Laboratory
- Manufacturing Technologies Center
- Materials and Process Diagnostics Facility
- Mechanical Test and Evaluation Facility
- National Solar Thermal Test Facility (NSTTF)
- NUFAC Nuclear Facilities Resource Center
- Photovoltaic Laboratories
- Plasma Materials Test Facility
- Primary Standards Laboratory
- Pulsed Power and Systems Validation Facility
- Radiant Heat Facility
- Radiation Detector Analysis Laboratory
- Sandia's Orpheus Site
- TIE-In / The Technology Information Environment for Industry
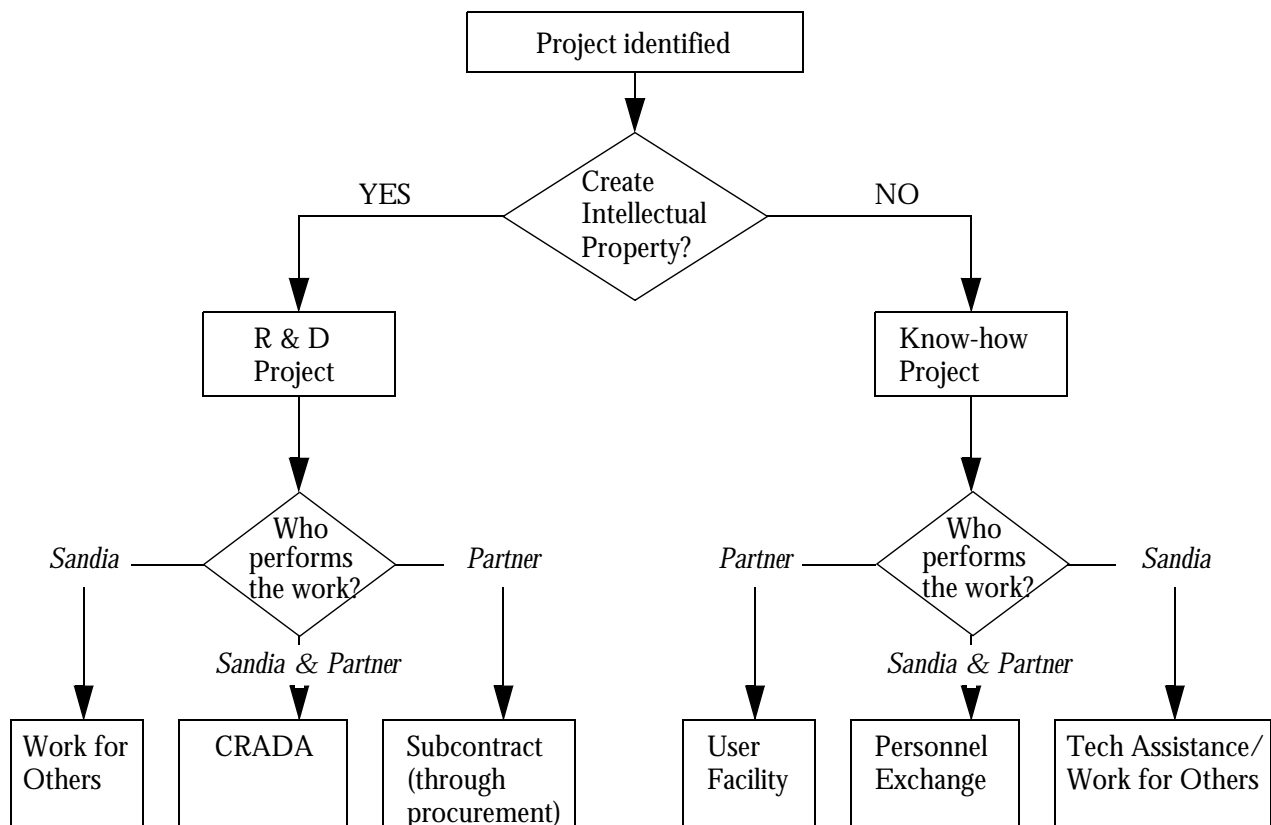- Virtual Laboratory Testbed

Figure 4. Pattern to Determine the Appropriate Agreement Type.

Business Development and Marketing

Business development and marketing are critical activities in these days of changing missions and shrinking resources. Business development is a strategically planned and tactically executed deployment of resources to maintain or win new business. The business development process should be an integrated lab-wide effort to generate the results that are necessary to support Sandia's strategic objectives. Proper business development and marketing can reduce the risk of partnering activities.

The business development and marketing groups can provide line organizations with many different types of information to help them make decisions regarding potential partnering relationships. These services include:
* technology assessments (internal and external),
* company profiles (competition),
* industry evaluations (needs and opportunities assessment),
* aid in selecting promotional techniques,
* development of technology roadmaps,
* creation of business plans,
* preparation of marketing plans, and
* strategic marketing.

Some of the Sandia line organizations are very active in business development, having appointed staff to specialize in that area. These people interact with the corporate business development and marketing staff, and with the agreement specialists to look for and create win-win opportunities.

Each Sandia business unit should develop a business plan identifying steps for exploiting intellectual property. The goals of the business unit determine when and how IP should be identified and protected. Investments in IP (patents, etc.) should be based on maximizing their value to Sandia. Business development and marketing tools aid in making such decisions.

Team-Specific Information

Teams represent functional areas of stakeholder groups. No equivalency in terms of resources or power is intended. The use in the game of four Sandia staff teams and four industry teams does not imply that Sandia is equally important to all of industry's R&D effort. It is simply an artifact of the need to have adequate representation from all of these stakeholders to meet the objectives of the game.

Sandia Staff Teams

Sandia National Laboratories' strategic plan has eight strategic objectives, four that focus on **what** will be accomplished, and four that focus on **how** the work will be done. The Sandia staff is represented by five teams in this game, four that are aligned with the four 'whats' of Sandia's strategic plan, and one that has business development and marketing as its focus. The four 'whats' teams represent the line organizations (and management structure) that perform work related to the four mission areas, respectively. The business development team represents those organizations for which business development, marketing, or external alliance forming are the primary functions.

All five teams operate with some overriding challenges. In an era of decreasing federal budgets, Sandia must have sufficient resources (funding, people, facilities) to meet its national missions. The number of CRADAs at Sandia has been decreasing for several years. The Sandia line organizations sometimes feel that the TPC, Business Development, and DOE groups stand in their way of getting things done. By contrast, those groups sometimes feel that the Sandia line organizations would give away Sandia's intellectual property without receiving any value in return, or that they ignore opportunities to help fund basic research that helps to maintain capability.

In addition, each team has specific challenges relevant to the mission areas for which it has responsibility. Sandia's strategic plan for each of the four mission areas is quoted below.

Sandia Staff 1 (S1): Nuclear Weapons

Our primary mission is to **ensure that the Nuclear Weapons Stockpile is safe, secure, and reliable and fully capable of supporting our Nation's deterrence policy**. We bear a singular accountability with Los Alamos and Lawrence Livermore national laboratories for two critical elements of nuclear deterrence: the nuclear weapons stockpile and the expertise that ensures the stockpile remains safe, secure and reliable. We honor that accountability. We will:

be the systems integrator for our DOE and DoD customers and our laboratory and production facility partners in planning and executing the work of sustaining the stockpile.

maintain the vitality and effectiveness of our scientific and engineering capability and the expertise we need to perform our nuclear weapons mission.

provide leadership for the nation in setting and meeting the highest standards for surety (safety, security and reliability) of the nuclear weapon stockpile.

provide our customers with technical options to assess and respond to changes in the global nuclear threat.

Sandia Staff 2 (S2): Weapons of Mass Destruction & Other Nuclear Incidents

We will **reduce the vulnerability of our nation to proliferation, threat, or use of weapons of mass destruction and other nuclear incidents**. This mission is synergistic with our nuclear weapon mission. We will:

use technology and analysis in pursuit of stable international nuclear relationships to secure special nuclear materials, especially in the former Soviet Union; developing means to monitor nuclear weapons activities effectively and affordably; and supporting regional security initiatives.

extend and apply our technology and analysis to threats involving chemical and biological weapons.

advance realistic solutions to our nation's legacy of nuclear weapons waste and related nuclear waste problems.

apply the approaches we develop for weapons and nuclear weapons surety to other systems whose failure would have highly adverse consequences for our national security.

be a significant provider of science and technology solutions to assess evolving national threats.

Sandia Staff 3 (S3): Energy and Critical Infrastructures

We will **enhance the surety (safety, security and reliability) of critical infrastructures**, focusing on implications for the security of our nation relative to the increasing interdependency of global infrastructures. We will protect against threats to the supply and distribution of energy and other critical commodities, information infrastructures (including telecommunications and finance), and environmental quality. We will "wage peace" by identifying these threats, developing technologies to mitigate them, and proposing alternative solutions. We will support DOE and other agencies in responding to these threats. We will:

enhance our nation's ability to **identify and assess risks and manage vulnerabilities of global infrastructures**.

improve the reliability and reduce the vulnerability of energy generation, conversion and distribution infrastructures.

leverage our environmental technologies and systems **to prevent or solve serious environmental problems that might lead to conflict between nations**

develop rigorous analytic tools for policy makers to better anticipate the complex dynamics of energy, the environment and national security.

deepen our scientific understanding and enhance our science and technology programs that play an essential role in developing solutions to threats against energy, information, environmental quality, and other critical infrastructures.

Sandia Staff 4 (S4): Emerging National Security Threats

We will **develop high impact responses to emerging national security threats**. We will apply our differentiating scientific and technological strengths to provide our nation with advanced technologies and systems solutions. We will:

combat terrorism.

support counter proliferation by deterring and, if nec-

essary, defeating production, storage and delivery of weapons of mass destruction and mitigating their effects.

deter and respond to attacks on US information resources and infrastructure.

mitigate the war-fighting capability and the enduring deadly legacies of mines, unexploded ordnance, residual biological and chemical warfare agents, and leftover ordnance of all types.

contribute to DoD military solutions that are technologically superior. We will apply our scientific and technological capabilities to **create system-level innovations that provide advantages over adversaries** in critical areas such as advanced sensor systems, advanced conventional weapons, military space and ballistic missile defense.

Specific Instructions for Sandia Staff Teams

Planning: Your team missions are given by the strategic plan, which will be assumed to remain constant for planning purposes. There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. Second, you should make a list of the core capabilities or competencies that are owned by the line organizations whose primary focus is support of your mission area. This is not intended to be an exclusive or all-inclusive list, but should include those core competencies that allow you to achieve your mission goals, as well as some technology assets that may be of value to industry. This list should be prioritized in terms of which competencies you feel are the most important to maintain and protect over the next ten years.

Next, using the strategic plan as a guide, envision the state of your mission area in the year 2005, and identify a set of four specific technological goals that you must meet by then to reach your desired state. These four goals do not necessarily need to cover the entire space your mission occupies - they just need to be four goals that can be pursued in the game context. Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 5. Milestones that require new 'know-how' rather than a simple extension of existing capabilities are most desirable. You may wish to define these

milestones in such a way that you maintain those capabilities that you consider essential to your future.

Please note that during the game your technology goals should be fixed, but the strategy as to how to reach the goals (i.e., the specific milestones) may change with changing information. Your ability to stay abreast of the changing information in the game will in some measure determine your success. You may wish to enlist the Business Development Team to support you in that effort.

In addition to defining specific technology goals and milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team.

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in

common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

Sandia Business Development (SBD)

The Sandia Business Development Team represents the corporate business development and marketing organizations, and has primary responsibility for conducting and facilitating business development, marketing, and other related efforts. Many of this team's functions are listed in the "Partnering at Sandia" section of the handbook.

This team has several potential challenges related to their primary functions. Many in the line do not see the need for a business development or marketing role in the labs' work. Many resist the changes that are required in these times of budget reductions. Many do not have a customer orientation. Many do not see the need or the value (to themselves, their employer, or the country) of transferring useful technology. Still other challenges exist in the integration of business development with laboratory mission planning functions, and in coordination of the activities of this group with those doing business development in the line organiza-

Milestone 1 (2yr)	Milestone 2 (4yr)	Milestone 3 (6yr)	Milestone 4 (8yr)	GOAL

Figure 5. Example Matrix of Goals and Milestones (applies to Sandia Staff, Industry, and Competitor Teams).

tions.

Planning: Your team should initially meet to define your team goals and metrics to track your progress, and to develop approaches and responsibilities to help you meet those goals. You may then wish to spread out and spend much of your planning time interfacing with the SNL staff and industry teams. Your roles may include information gathering and facilitation of interactions between Sandia staff and industry teams.

Resources and Moves: Your team will be given very few resources, as your need for chits to do research is small. You may charge others for your services if you wish, yet remember that the game resources are scarce. Your greatest assets are likely to be the timely collection and dissemination of critical information, and your ability to facilitate the building of relationships between other parties.

Twice during the game your team will be called upon to report your observations to the rest of the participants. This will occur at the ends of sessions 2 and 5. Since you will have more collective knowledge about what is happening in the game than most other teams, you should take this time to relay the information that you feel will help all teams meet their goals more effectively.

Agreements/Administration

Sandia Agreements (AG)

The Sandia Agreements Team represents the agreement negotiation and processing, legal, and intellectual property-related functions of the Technology Partnerships & Commercialization organization at Sandia. This team is staffed with people who perform these functions every day, and who understand the specifics of the partnership process in detail. Your role in the game is to do what you do in life, but on a time-compressed basis. All of the details and legal wording of agreements are of less importance in the game than the process by which an agreement is made.

Your potential challenges are related to being the middleman in a process. Many in the line do not understand your function. Many have no knowledge of the requirements under which you operate. Many have no

understanding of what they can and cannot do with respect to interactions with industry. On the other end, you have to satisfy the people at DOE and their requirements, which can change frequently.

Planning: You should spend some time working to develop a statement about the status quo of the partnering mechanics and define a desired future state. This may include changes in process, policy, regulations, or anything else that will allow you to reach the desired state. The DOE Team will be doing much the same thing during this session. After defining the status quo independently, you should meet with the DOE Team to reconcile your perceptions of the status quo, and to define joint approaches to meeting desired future states.

Resources and Moves: Your team will be given no resources (chits). However, for Small Business Initiatives or other issues overlooked by the game, see the Control Team for resources.

Your roles during the negotiation sessions will be to negotiate and process agreements between industry and the Sandia staff teams, and to pursue any changes you wish, based on your planning, to bring about the desired state.

In addition, for any agreements made between industry and the *Competitor Team* in their 'other Federal Labs' role, you should function as their Technology Partnerships organization. You may wish to designate one or two people from your team to function in that role when it arises.

DOE Administration (DOE)

The DOE Administration Team represents that part of DOE, both locally and at headquarters, whose function is to manage and interface with the technology transfer program at Sandia. This team is staffed with people who perform these functions every day, and who understand the specifics of the partnership process in detail. Your role in the game is to do what you do in life, but on a time-compressed basis. All of the details and legal wording of agreements are of less importance in the game than the process by which an agreement is made.

Your have several potential challenges. DOE has been under fire for many years, and some fear that the department may be dismantled in the future. Budgets are continually shrinking, both for mission-related activities, and for oversight functions. A reduction in force is a possibility for the future. Missions are changing along with interpretations of how certain work relates to missions. Some of you worry that Federal labs aren't making agreements that are good for DOE or the government.

Planning: You should spend some time working to develop a statement about the current status of the partnering mechanics and define a desired future state. This may include changes in process, policy, regulations, or anything else that will allow you to reach the desired state. The Sandia Agreements Team will be doing much the same thing during this session. After defining the status quo independently, you should meet with them to reconcile your perceptions of the current status, and to define joint approaches to meeting desired future states. Other things you may wish to do during the planning session are determine a strategy toward industry partnerships, or assume a higher level role and define changes in DOE's mission, especially in how those changes would relate to partnerships. If you have ideas of changes you would like to make that seem to be outside of the game, please see the Control Team. The game is flexible and can accommodate many changes.

Resources and Moves: Your team will be given no resources (chits). However, for issues outside those stated here, see the Control Team for resources.

Your roles during the negotiation sessions will be to interact with the Sandia Agreements Team on agreements between industry and Sandia, and to pursue any changes you wish, based on your planning, to bring about the desired state.

In addition, for any agreements made between industry and the *Competitor Team* in their 'other Federal Labs' role, you should function as their DOE oversight organization. You may wish to designate one person from your team to function in that role when it arises.

Industry

Your four teams represent the R&D business units of corporate America. You are interested in technical development which will result in enhancing your position in the marketplace. In fact, your overriding challenge is to either remain or become internationally competitive within the next decade. In many cases, this means that you must acquire or develop appropriate technologies before your competitors. You are willing to enter into collaborative agreements with appropriate organizations for the research, development, or licensing of technologies which you believe your company can commercialize. However, any such agreement must promise a certain minimum return on investment with sufficiently low or acceptable risk. With respect to federal laboratories, you are concerned about directives which govern (or limit) their ability to enter into collaborative and joint venture agreements. You would like to simplify and expedite the CRADA process. You are also concerned about competition from the laboratories as an R&D entity, and issues concerning ownership of intellectual property.

Each of your teams has a focus on a different sector of the economy. Specific examples of the industry functions that are comprised in your team description are given below. There is a certain amount of overlap between teams on some functions, just as there is in real life. Due to the scope of the game, many fields are not covered. If you wish to add a specific focus to your team, please check with the Control Team so that this can be coordinated with the other industry teams.

Industry 1 (I1): Information Technology and Computing

The Information Technology and Computing team is comprised of the following minimum list of industrial functions:
- chip design and manufacturing,
- computer design and assembly (this may cover the spectrum from personal data assistants to supercomputers),
- software development,
- networking technologies,
- internet applications,
- information surety,
- telecommunications, and

- any large-scale, information-related areas from other fields (e.g., telemedicine).

Industry 2 (I2): Energy, Environment and Transportation

The Energy, Environment and Transportation team is comprised of the following minimum list of industrial functions:
- energy resource extraction,
- fuel production,
- power generation,
- environmental restoration and remediation technologies,
- pollution prevention and reduction technologies, and
- transportation infrastructure (personal vehicles, highways, bridges, etc., but not aerospace).

Industry 3 (I3): Advanced Manufacturing and Advanced Materials

The Advanced Manufacturing and Advanced Materials team is comprised of the following minimum list of industrial functions:
- robotics,
- packaging and assembly,
- chemicals,
- high-tech plastics, ceramics, rubbers, glasses, metals, and composites, and
- materials-related processes (e.g., casting, forming, deposition, lithography, etc.).

Industry 4 (I4): National Security and Criminal Justice

The National Security and Criminal Justice team is comprised of the following minimum list of industrial functions:
- traditional military contractors,
- aerospace (aircraft, space, missiles, etc.) and similar structures,
- secure communications and encryption,
- information surety,
- sensors and detection technology, and
- chemical and biological agent technology.

Specific Instructions for Industry Teams

Planning: There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. You may make decisions and use resources as a team in all regards, or you may choose to operate as separate functional units, each with a portion of the resources and authority to use them. You may choose a different mode of operation altogether. Second, you should choose the functional areas in which you will concentrate your actions. You may wish to spend a few minutes to list the core capabilities or competencies that are basic to these functions. This is not intended to be an exclusive list, but should include those core competencies that you feel are critical to staying competitive in your industries over the next ten years.

Next, envision the state of your functional areas in the year 2005, and identify a set of four specific technological goals that you must meet by then to reach your desired state. These four goals do not necessarily need to cover the entire space your team occupies - they just need to be four goals that can be pursued in the game context. However, *one of these goals must be appropriate for a small business concern.* Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 5. Milestones that require new 'know-how' rather than a simple extension of existing capabilities are most desirable. You may wish to define these milestones in such a way that you maintain those capabilities that you consider essential to your future.

Please note that during the game your technology goals should be fixed, but the strategy as to how to reach the goals (i.e., the specific milestones) may change with changing information. Your ability to stay abreast of the changing information in the game will in some measure determine your success. You may wish to communicate with the Sandia Business Development and Agreements Team to support you in that effort. You may also wish to find other ways to scan for this type of information.

In addition to defining specific technology goals and

milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team (e.g., for Congressional action).

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

Competitor Team (RED)

You represent universities and federal laboratories other than Sandia. You have a dual role, and in any of your actions, you must specify whether you are wearing your 'university hat' or your 'laboratory hat.' You also have a dual role in terms of team goals. You should be loyal to the constituency you represent in the game (universities and other federal laboratories). You face challenges of shrinking funding, reduced numbers of graduate students who can perform technical work, and greater oversight. Your actions should also provide positive incentives and feedback to help the Sandia teams to improve their partnering processes.

You should assume that you have the technological capabilities of your constituency. In the university role, this means that you have the ability to perform basic science in nearly all fields, often at the lowest possible cost because of the availability of graduate students. However, due to relative inexperience, you often may not be able to do the job as quickly as others would. You also have few of the large-scale facilities that are often available at industrial or federal laboratories.

To maintain fairness in the game, your team cannot operate without restriction. Any time you are wearing your 'laboratory hat,' you will have to satisfy the same requirements that a Sandia team would. In a partnering arrangement, the Sandia Agreements Team will act as your negotiating, legal, licensing, etc., agent. Any government agency approvals you require will be handled by the DOE Team.

Planning: There are several things you should accomplish during the planning session. First, you must establish ground rules by which to operate as a team. You may make decisions and use resources as a team in all regards, or you may choose to operate as universities and laboratories, each with a portion of the resources and authority to use them. You may choose a different mode of operation altogether. In any case, you must set operating rules and inform the Control Team of what they are.

Next, envision the state of the world in the year 2005, and identify a set of four specific technological goals that you would like to meet by then that you feel are particularly fruitful in terms of potential partnerships. These four goals do not necessarily need to cover the entire space your team occupies - they just need to be four goals that can be pursued in the game context. These may take the form of responses to grand challenges, or may be reactive to the needs of industry. Then, for each of the four technology goals, set four intermediate milestones, again technology oriented, that are on the critical path to achieving each goal. The resulting matrix of goals and milestones should resemble that shown in Figure 5. Milestones that require new 'know-how' rather than a simple extension of existing capabilities are most desirable.

Please make every effort to maintain your technology goals throughout the game. However, we realize the breadth of technology capabilities on your team. If the focus of game play moves into new areas in which you have significant capabilities, you may alter your goals and milestones accordingly.

In addition to defining specific technology goals and milestones, you should also identify any other changes (e.g., policy, regulation, structure, etc.) that are needed for you to achieve your desired state in 2005. Any desired changes should be pursued in the game with those teams that have the authority to implement such

changes. For additional information on how to document these moves, see the section on "Goals, Milestones, and Moves." If no team has responsibility for the area in which you desire changes, please see the Control Team.

Resources and Moves: You will be given some resources (chits) during each negotiation session with which to make moves to meet your milestones. These resources will not be enough to meet your milestones on your own. Therefore, you should look for opportunities in which your milestones have something in common with milestones from other teams. It is unlikely that any of your milestones will match any of those from other teams. However, it is likely that at the underlying technology or competency level, you will have much in common with other teams. You may wish to partner on that basis.

Goals, Milestones, and Moves

Goals and Milestones

The purpose of this section is to give the Sandia staff, industry, and competitor teams more guidance on the scope and focus of their planning. Each of your teams has been directed to develop four technology or product-oriented goals that you would like to achieve for your technology/product portfolios over the next 8-10 years. For each of those goals, you are to define four separate technology milestones that are on the critical path to achieving the goals. Table 1 gives an example of the technology focus and level of detail that we feel are appropriate for the goal and milestones.

We realize that, for product development, the pattern shown in Table 1 does not follow the pattern often followed by industry of:
*   technology development
*   characterization
*   prototype production
*   full-scale production

Although the implementation of production lines are an integral part of industrial activities, in the context of this game, production issues are unlikely to help the game meet its objectives. Thus, we ask you to define all of your milestones to be technology-related rather than production-related.

Table 1: Example of Goal and Corresponding Milestones (scope and technology focus).

Milestone 1	Milestone 2	Milestone 3	Milestone 4	GOAL
Develop high-efficiency engine capable of 70-80 mpg. Some possibilities include gas, gas-electric hybrid, or fuel cell engines.	Create power train technologies for each of the options considered in milestone 1.	Develop and test new ceramic, alloy, and/or composite materials to reduce vehicle weight.	Develop, test, and implement new manufacturing techniques to ensure milestone 1, 2, and 3 goals are achievable in production (e.g., composite molding technology)	New generation vehicle getting ~80 mpg becomes available for production.

Moves

In real life, the partnership process can require many steps, as summarized in Figure 3, and take many months of research and negotiation. In this Prosperity Game^{TM}, the purpose of making agreements is not to make perfect agreements, but rather to test and improve the partnership process, the business development and marketing functions, and the way in which people form relationships and interact. Thus, the agreement process will be abbreviated for game purposes.

All negotiation sessions (2, 3, 5, 6) will begin with the distribution of chits to the teams. These chits are meant to be spent on those moves by which teams achieve their goals and objectives. Moves can take several forms including:
*   internal R&D (provided the team has the necessary monetary and technical resources to accomplish the desired objective),
*   an agreement to license a technology or process from another team,
*   any of the partnership agreement types shown in Figure 4 (e.g., CRADA),
*   a partnership between industries not categorized in Figure 4, and
*   a policy, regulation, or process change that will allow a team to more readily achieve its objectives.

This list is not intended to be comprehensive, but rather to give examples of the ways in which a team can accomplish its goals during the game.

Each move should support completion of one milestone. For example, it is unlikely that any two teams will have a specific milestone in common. However, the underlying competencies or basic scientific fields to milestones may have much in common. For game purposes, a move based on an underlying competency will

Game Move / Agreement Form

1 **Specific Objective:** Develop composite materials to replace existing automobile structural members and body that reduces weight by 50% and fabrication costs by 50%. This include some basic materials characterization, but not the full suite of characterization necessary for use in manufacturing.

2 **Move Number:** I2-1-3

3 **Cost and Schedule:** $30M from I2 to SNL/LANL over 6 years (1998-2003)

4 **Terms and Conditions (disposition of IP, etc.):** IP will be owned by inventing party, and will be licensed to partners. DOE/Lab funding - $3M/yr. for 6 years. USCAR funding - $5M/yr. for 6 years and $10M/yr. of in-kind R&D, testing, and production technology upgrades.

5 **Agreement Type:** CRADA

Initial if used
SBD Team: Business Dev.   XYZ
SBD Team: Marketing
AG Team: Legal   ABC
AG Team: IP review   DEF
DOE Team   NML
Other_____

Move satisfies other deliverables? S2-3-2, RED-1-3

6 **AGREEMENT MATRIX (Check one box)**

	Low	Med	High	COST
Low Risk				
Med Risk			XX	
High Risk				

7 **Control Team Review (initials/date/time):** MB 9/4   4:30pm

8 | **Participating Teams** | **Chits** | **Signatures** |
|-------------------------|-----------|----------------|
| Industry 2 | 4 | SDF |
| Sandia 2 | 1 | UIO |
| RED (LANL) | 1 | BHU |

count as fulfilling the milestone to which it pertains. Thus, partnerships based on these competencies will satisfy milestones for all parties to an agreement.

All moves must be submitted to the Control Team on an *Agreement Form* (see facing page for an example agreement that would satisfy milestone 3 from Table 1) to be valid. The Agreement Form requires certain information: the **specific objective** of the move, proposed **cost and schedule**, and business **terms and conditions**. The form should be filled out as follows:

- [1] For the Sandia, industry, and competitor teams, if the move is technology-oriented, the specific objective should support fulfillment of one of the milestones from your planning session. If the move is policy, regulation, or process-oriented, the objective should state the desired results.
- [2] The agreement number should be assigned by the originating team based on the following formula - team name, goal number, milestone number (TTT-G-M). For example, an agreement originated by the Industry 2 Team for goal 3, milestone 1 would be tagged as I2-3-1.
- [3] If there are cost and schedule requirements related to the specific objective, they should be stated here.
- ¼ Terms and conditions of the move should be explicitly stated. If this is an internal R&D move or a policy move, justification for the move should be written here. For a partnership or licensing arrangement, this section should include a statement of work (who does what) as well as payment terms and legal issues such as disposition of intellectual property developed under the agreement. The Sandia Agreements Team should help in this area of the agreement.
- ½ If a specific agreement type (e.g., CRADA, Work for Others, etc.) is required, it must be noted in the first box on the left of the form. NOTE: All industry-Sandia agreements require *Agreements Team* involvement. If a new agreement type is created in the game, it must be noted here as well. Any additional approvals needed for a specific agreement should also be noted here along with proper approval signatures.
- [a] For a technology-oriented move, the originating team should rate the move in terms of cost and risk in the Agreement Matrix (bottom left box).
- [o] The Agreement Form should now be submitted to the Control Team for review and pricing. The price of a move is based primarily on the Agreement Matrix. Higher risk or higher cost will both be reflected in a greater number of chits being required to consummate the agreement. The Control Team will finalize the price (number of chits) in consultation with the originating team.
- ¾ Once the move has been priced, the originating team should finalize the agreement with any partners, collect the necessary chits, note the participating team along with the number of chits each pays, and bring them back to the Control Team.

When a technical move is accepted by the Control Team, a certificate will be issued to the originating team denoting that the milestone that the move was based on has been met. If a move simultaneously meets milestones of more than one team through a partnering arrangement, this should be noted on the agreement form, and certificates will be issued to all parties.

Please keep in mind when making moves and forming partnerships that the game is very flexible. Creativity (as opposed to fantasy) in making moves is rewarded.

Policy, regulation, and process moves should also be submitted to the Control Team for final approval. These moves should be made on the "Game Move" form and should contain the information from blocks [1], [2], ¼, [o], and ¾. The terms and conditions from block ¼ here should state the new policy or regulation. Block [1] should give the projected results of the change. the Move number in block [2] should use the following format: TTT-P-xx, where TTT is the originating team, the P stands for policy, and xx is sequential numbering. If the move is such that it would require the aid or approval of another team in real life, the Control Team will require it as well. Any of these types of moves will be implemented into the game immediately. For example, changes in DOE policy may change the types of approval necessary for certain types of agreements. These changes would be broadcast to the group, and implemented immediately through the DOE and Sandia Agreements Teams.

Technology Briefs

The Nexus of Information Technology and Biotechnology

Description: We are in the middle of surges in both information technology and biotechnology. In the information technology area, enormous steps in the use of databases, imaging, and modeling are taking place while we are enjoying quantum steps in both capability and performance of the technology. Breakthroughs of equal impact are occurring in biotechnology and its closely related fields. Genomics, structural biology and health care technology all are each at the threshold of major change. The intersection of these technologies provide an enormous opportunity to impact quality of life issues with each of these branches of science pushing the other.

Threats: Health care costs have risen much faster than the national GDP. Costs have become such an issue that our university, industry and laboratory biotechnology research will ultimately impact our lives only to the extent that it can be used and delivered in a cost-effective manner.

Opportunities: Information technologies have highly impacted a large number of fields ranging from communications, to business transactions, to optimizing the performance of our automobiles. Routine activities have lower cost by orders-of-magnitude while providing greatly improved capability. We are on the threshold of a similar level of impact upon our quality of life issues.

Genomics - The human genome with ~3×10^9 base pairs will be fully sequenced in about five years. Sequencing will be enabled by TeraBytes of memory and TeraFLOPS of performance. This is the first step toward functional genomics where the individual parts of the genome are correlated to disease susceptibility which will, in turn, lead to revolutionary treatment approaches.

Structural Biology - Ubiquitous and TeraFLOP computing will allow simulations of multi-hundred atom quantum chemistry problems from first principles, the study of microsecond time-scale molecular dynamics and the broad study of molecular biology problems. We will be able to understand how proteins function/malfunction in causing disease and assess the risk of adverse exposure.

Health Care Technology - We are approaching the ability to accurately model much of the complexity of the human body. Insights provided by such modeling will allow the development of entirely new treatment approaches, optimized therapies and the expectation of reduced and contained costs. Telemedicine offers the prospect of improved diagnostics and monitoring, and even limited forms of critical care.

A Coalition: This topic can forge a strong partnership among the three parts of the R&D triad (industry, universities, laboratories). Strong university programs are impacting the underlying science; industry maintains the strong customer focus and exhibits significant entrepreneurial investment; and the laboratories are pioneering advanced genomics and TeraFLOP computing. It will inevitably impact the quality of our lives.

Energy Supply and Security

Description: Energy supply, economic and environmental security are inexorably intertwined. The nation's policy direction and the subsequent role of technology, in supporting a safe and environmentally sound future, are key national issues. Universities, national laboratories, and industry can collaborate to deliver safe, environmentally sound energy supply and security solutions to the nation.

Threats: Energy security remains a major public policy goal for the United States. Though the threats are not as pervasive as during the Cold War, the United States still lives in a world full of risks.

The growing dependence on imported oil, particularly from the Persian Gulf, has significant implications for the Nation's economic and national security. The United States will import well over 50 percent of its oil in five years and will approach 60 percent in ten years. Should these forecasts prove to be accurate, the Persian Gulf nations' oil revenues may triple from $80 billion to nearly $250 billion a year in 2010 which translates to a potential inflow of more than $1 trillion over this 15-year span. The weaponry, influence, and mischief that money could buy in this chronically unstable region is a security threat that the Department of Energy is working to reduce.[1]

DOE's current energy R&D budget has dropped by about 74% (in constant dollars) from its 1978 budget. In 1995 the total federal investment in energy R&D was only about 0.5% of the total U.S. energy expenditure.[2]

Opportunities: Energy supply and efficiency R&D is needed to help mitigate the economic risks of disruption to the Nation's energy supplies. Energy and environmental science can help our nation reduce dependence on foreign oil and support innovative energy and environmental policy. Here are some of the areas where universities, industries, and national laboratories can collaborate to create solutions to energy and environmental problems:

- Enhance our energy security and develop clean energy.
- Develop alternative energy sources such as solar, geothermal, nuclear, hydrogen, and fission energy.
- Understand global warming issues and contribute to the reduction of greenhouse gases.
- Develop an alternative to the internal combustion engine.

A Coalition: This topic can forge a strong partnership among the three parts of the R&D triad. Strong university programs are contributing the underlying science; industry maintains the strong customer focus and exhibits significant entrepreneurial investment; and the laboratories are pioneering advanced energy and environmental science. It also will inevitably impact the quality of our lives.

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1. *Statement of Charles B. Curtis, Deputy Secretary, US Department of Energy Before the United States Senate Committee on Energy and Natural Resources,* September 4, 1996

2. *Industrial Ecology Prosperity Game™ Players' Handbook,* May 20-22, 1997

Industrial Ecology

Description: Industrial ecology (IE) is an emerging scientific field that views industrial activities and the environment as an interactive whole. The IE approach simultaneously optimizes activities with respect to cost, performance, and environmental impact. The IE approach provides a dynamic systems-based framework that enables management of human activities on a sustainable basis by: minimizing energy and materials usage; insuring acceptable quality of life for people; reducing the ecological impact of human activity to levels that natural systems can sustain; and maintaining the economic viability of systems for industry, trade, commerce, and government.

The current suite of IE tools includes: industrial metabolism; dynamic input-output modeling; design for the environment; product life extension; and industrial ecosystems.

Threats: At current usage, oil reserves may be depleted in 40 years. Fossil fuels are the mainstay of the energy economy. Their use produces air quality concerns and potential environmental damage. Although the impact is highly uncertain, burning fossil fuels does increase the concentration of CO_2 and other gases.

In many places, water supplies are marginal, and water is being pumped from aquifers faster than it is being replaced. Loss of agricultural land can be attributed to greater urbanization, overproduction and soil erosion.

The current regulatory environment is compliance-based and extremely expensive. Environmental regulations are estimated to cost the nation about $500 billion per year, and to consume 5 billion hours of paperwork per year.

Opportunities: IE treats industrial processes and the environment as an ecosystem. Waste materials and energy from one process might profitably be used as raw materials and inputs to a different process. IE seeks to simultaneously enhance profitability and reduce environmental impact. To succeed, it needs to apply systems engineering concepts across industry and government sectors. By its nature, it encourages multi-sector, multi-company partnerships. It allows for competition in markets, but cooperation in reducing

costs and increasing efficiency.

IE can help satisfy the government's needs for reducing problems associated with waste generation and disposal, for lowering costs of government services, and for protecting the environment. Universities can help develop IE science and train new practitioners. Industry can profit by reducing the costs of resources and energy, and help move the nation to performance-based environmental regulations rather than compliance-based.

A Coalition: Because waste in one area can be a valuable input in another, IE naturally requires a partnership among users. The IE skills and research required include large-scale facilities, systems engineering, supercomputing capabilities, education and training, expertise in many scientific fields, and expertise in advanced manufacturing and applications. Hence, all three members of the R&D triad can both contribute to generate the required knowledge and use it to help meet their own private needs as well as the nation's requirements.

Food for Thought

Some Thoughts on Building Strategic Partnerships

by Gary J. Jones

Strategic partnerships are an integral tool in supporting our missions and enhancing our ability to meet the nation's needs while helping to broaden our understanding, capabilities, and competencies. Partnerships help the laboratory to leverage resources to provide the finest product and services at a lower cost. These views have been reinforced in the Laboratories' strategic plan and in numerous publications and presentations.

While we speak extensively about strategic partnerships, there are still questions about the definition of "strategic," and the entire process for developing partnerships. Much of this misunderstanding results from the failure to clearly distinguish **mission** plans from **partnering** plans within organizations. The mission plans and the partnering plans must be interlinked, but they do not have the same customers, products, or objectives. This note examines this situation by looking at an analogue in the commercial world and analyzing how this could be applied at Sandia.

Defining "Strategic"

In this discussion we are not talking about our partnerships with other DOE labs or production sites, or other projects that are directly part of our mission activities. Instead we are speaking of those partnerships typically with non-federal entities. Such a partnership is considered to be strategic if it helps the laboratory fulfill its missions—now and in the future—by enhancing our capabilities, facilities, and understanding. This enhancement can be direct, such as providing the Laboratories with new and broadened technologies, or indirect, such as increasing our understanding of existing technologies by exercising them on new problems. Determining the strategic value of a partnership requires that we have a concise statement of our missions and a plan for enhancing our abilities and assets through partnerships over time.

The Commercial Analog

In the commercial world, companies frequently undertake new ventures to strengthen their main product line. Often this comes in the form of vertical or horizontal integration, such as a soft drink company buying a fast food chain, or Disney buying a cruise line. We will refer to this as the development of an "ancillary line-of-business"—a line-of-business that derives from the main business path and helps support that path either directly or indirectly, but is not part of the main business. The ancillary lines-of-business in the commercial world fulfill the same function as the strategic partnerships do for Sandia—supporting the mission but not directly part of the mission.

To establish a successful ancillary business, industry utilizes a four-step process. First, the company or organization must define how it wants its main lines-of-business to evolve. The company then determines if this evolution can be enhanced by the development of supporting business lines based on its existing assets—expertise or product. If a new venture would enhance the main lines-of-business, the third step is defining the new ancillary product or service, and determining whether there is a sufficient potential market demand to support its development. Finally, the industry must plan how this product will be presented to the potential customer and the sale finalized.

Strategic Partnerships at Sandia

The Laboratories need to follow a similar four-step path in developing strategic partnerships. These steps are summarized in Figure 6.

1. Plotting the Evolution of Technology Areas: The first step is to develop a plan outlining the desired evolution of the given laboratory mission-related technology area. This plan addresses technology and capabilities development in the near- and mid-term, going beyond the typical strategic plan and including elements of a more detailed business plan focusing on the mission sponsors. This step is critical—without an understanding of
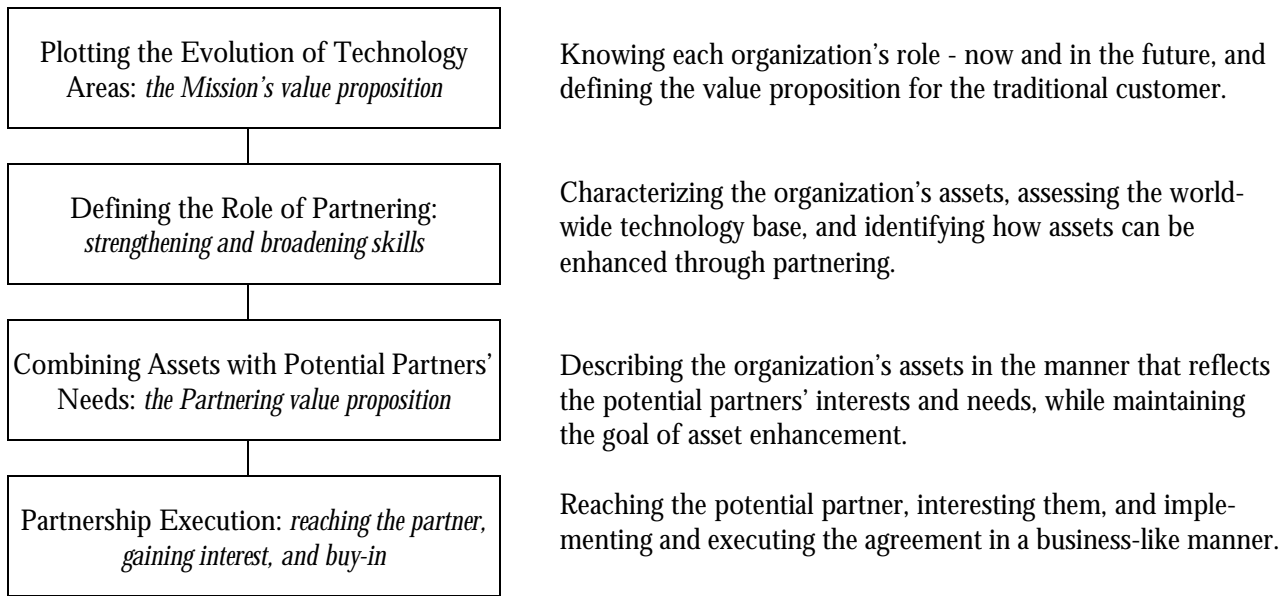
Plotting the Evolution of Technology Areas: *the Mission's value proposition*	Knowing each organization's role - now and in the future, and defining the value proposition for the traditional customer.
Defining the Role of Partnering: *strengthening and broadening skills*	Characterizing the organization's assets, assessing the world-wide technology base, and identifying how assets can be enhanced through partnering.
Combining Assets with Potential Partners' Needs: *the Partnering value proposition*	Describing the organization's assets in the manner that reflects the potential partners' interests and needs, while maintaining the goal of asset enhancement.
Partnership Execution: *reaching the partner, gaining interest, and buy-in*	Reaching the potential partner, interesting them, and imple-menting and executing the agreement in a business-like manner.

Figure 6. Four Steps to Defining and Developing Strategic Partnerships.

the desired mission-related development path for the Laboratories' technology areas, it is impossible to determine the strategic value of a partnership.

2. Defining the Role of Partnering:
    Once the desired future direction has been deter-mined, the role of partnerships in pursuing that direction needs to be addressed. For each of the technology areas in step one, this will require an examination of Sandia's assets in the light of other entities' assets. The assets represent the facilities and capabilities that make an organization uniquely qualified to pursue their mission, and the intellec-tual property (patents, copyrights, and commer-cially valuable information) that represent past accomplishments. Such an analysis will help define the degree to which the Laboratories can improve its assets to enhance mission performance through partnering. Since strategic partnerships can provide both direct (expertise) and indirect (application) support of Sandia's mission, it is important that this assessment recognize both potential benefits.

3. Developing the Value Proposition:
    Knowledge of the Laboratories' mission-related development goals, the assets in each technology area and the way these assets can be enhanced through partnerships, plus information about the

interests of potential partners, are the materials needed to define the new ancillary business. Not only must the Laboratories' environment be understood, it is necessary to develop an under-standing of the market environment for each ancil-lary business. The latter includes knowledge of the potential customer, their needs and how our assets address those needs. The result is a "Superior Value Proposition" (as defined by Lynn Phillips' course on *Building Market-Focused Organizations*) for each of the proposed ancillary lines (partnerships areas). These value propositions will differ from the Laboratories' mission-related value proposition that focuses on traditional sponsors.

4. Partnership Execution:
    The final step includes reaching the potential part-ner, interesting them, and instigating the partner-ship. Reaching the potential partner and interesting them in the partnership requires the development of a "communications" (read "advertising") strat-egy. The strategy will have details unique to the technology area and the desired partner, and will include utilization of existing contacts, attending and displaying at selected conferences, web-site development, and targeted publications. Once a preliminary agreement to pursue the partnership has been reached, the final step is to negotiate and

implement the agreement in a timely manner. Of course, related to this is the continued monitoring of the agreement and assurance of customer satisfaction necessary for continued success.

The Services to Build Partnerships

For the technical organizations to follow this four-step process, services are needed that are typically not a part of the technical groups expertise. Therefore, if the Laboratories are to fulfill their objective in strategic partnerships, the technical organizations must have access to the tools and services necessary to successfully complete these four steps. The necessary services can be identified by looking at each step in more detail.

1. Services for *Plotting the Evolution of Technology Areas*:
   This step looks inward at the Laboratories, examining why an organization exists in terms of the Laboratories' mission, its current status and the evolution of its role over time. Completion of this step should result in a business plan (BMFO-type) that shows the organization's direction for the future in the context of the Laboratories strategic goals and objectives—aided by the "Line of Sight" activity now underway throughout Sandia. The services useful for completing this step are:
   - business planning facilitation,
   - technology roadmapping, and
   - future analysis through Prosperity Games.

2. Services for *Defining the Role of Partnering*:
   This step has two facets—the audit of the unique assets of the organization and the characterization of the equivalent assets of outside organizations. This step also begins the assessment of existing intellectual property. This step looks both inward and outward, and requires expertise not typically found in the technical organization. The tools and services necessary in this step include:
   - Partnership experts to assist in the definition and evaluation of unique assets,
   - Marketing and partnership development resources to facilitate the organizational audit including the characterization of outside "competitors,"
   - Licensing specialists to work with the line to identify existing intellectual property and establish awareness for the protection of future IP.

3. Services for *Developing The Value Proposition*:
   This step requires that the technical organization define the partnering product that will provide the desired strengthening of Sandia's mission-related capabilities, and that the interests of the potential partner be understood. During this step, capabilities and facilities will need to be characterized from the viewpoint of a product or service that can be provided to a potential partner, rather than from a mission technological advancement viewpoint. Obviously it is necessary to identify and determine the interest and needs of the potential partner. Based on the outcome of these analyses, the intellectual property strategy will decide between promoting licensing directly or using intellectual property as an enticement for partnering. Market surveys are typically required to determine the value of Sandia intellectual property and the best path for its development. Finally, all of this information needs to be combined, resulting in a clear, concise statement of the ancillary business line—the "Superior Value Proposition" mentioned above. These value propositions define not only the partnership direction, but also help determine how the potential partner will be reached. There should be a separate, but related, value proposition for each major product or group of customers from a given organization. Since the Value Proposition is the culmination of Sandia's product definition phase, it is important that the line organization verify the result by seeking input from partnership development organizations. Fulfilling these needs will require that the line receive support from a partnering **team** comprising partnership development specialists, licensing specialists and marketing resource personnel:
   - Partnership and business development specialists to help define the value proposition,
   - Marketing resource personnel to refine this definition and obtain the information needed to characterize the potential customer,
   - Licensing specialists to define and implement a strategy for utilizing the intellectual property to maximize its value to the line and the Laboratories. Even if the organization determines that partnering is not valuable, there needs to be an intellectual property licensing strategy.

4. Services for *Partnership Execution*:
   Having defined the product and the potential part-

ner or group of partners, the actual partnership development begins. This phase starts with an "advertising strategy" to make potential partners aware of Sandia's capabilities and value propositions. This strategy identifies target groups and mechanisms for accessing them, appropriate publications, and key process owners. The potential partners are contacted and a dialogue ensues, hopefully leading to a preliminary agreement to discuss partnering. The next activities are the individual potential partner interactions, drafting of work plans, and negotiation of the partnership arrangement. This phase requires two primary sets of services:

- marketing and communication resource personnel to develop and implement the activities targeting the potential customer,
- licensing and agreement specialists, and agreement analysts to negotiate and implement partnerships in an timely manner.

Implications of This Model

Viewing partnerships as ancillary business activities reinforces the definition of strategic partnerships and implicitly links all partnerships to a main line-of-business. In addition, several other observations can be drawn from the model. These are listed in no particular order.

- This model separates the strategic planning related to the mission from the planning related to ancillary business, or partnership, development. Unfortunately, some organizations combine the first three steps into one strategic planning exercise. The result is a partnering plan that appears to be driven by "commercial" logic (funds-in) rather than by mission enhancement.
- If there is confusion in the technical organizations between the value propositions in Step 1 and the type to be developed in Step 3 for the ancillary business lines, the strategic linkage may be difficult to describe. This leads to arguments that ask "Why are we doing this? This isn't what DOE wants."
- The traditional partnership services set is focused on step 4. While these services are important and rapid partnering must remain a priority, a truly effective partnership development program must address all four steps.
- Marketing and business/partnership development expertise is the only service present in all steps. This is certainly in contrast to the view that marketing is a

"bolt-on" or luxury service. A partnerships development center needs strong market and business expertise to effectively meet all of these needs.

- Licensing expertise and the development of a licensing strategy is a key element of the effort to identify assets and maximize their value. However, licensing is also the only activity that can operate even if no partnerships are sought. This gives the licensing team a unique outward focus while requiring that they stay grounded in the line organization's strategic planning.
- The services necessary for step 1 are currently available, but not widely recognized or utilized. This, and some of the other services, would need to be extensively socialized to be effective.
- The role of the partnership development manager could be to market these services and take part in the line's use of them. This involvement is probably most important in Step 2 and Step 3—although few organizations are involved in these types of activities.
- Information about progress against a strategy is valuable to the line, but not if the line does not have a strategy to judge the data against. Data systems, such as PartnerWorks must be integrated into early steps of the process as a strategic planning tool, or it will become primarily a tracking system for Step 4.
- Almost all of the services needed in this process, with the possible exception of the marketing and communication to reach customers in Step 4, can be characterized as "part-time." This implies that it would be most efficient to centralize the business and market expertise needed in Steps 1-3. The net result might be distributing "product marketing" but centralizing the planning assistance marketing function.
- Since each technology area will have unique assets and directions, the assignment of specific teams that work with the responsible organizations would seem appropriate. The teams would appear to be composed of marketing, licensing, business, and partnership development representatives.

Glossary

CRADA	Cooperative Research and Development Agreement - An agreement between one or more federal laboratories and one or more non-federal parties under which the government, through its laboratories, provides personnel, facilities, or other resources with or without reimbursement (but not funds to nonfederal parties). The nonfederal parties provide funds, personnel, services, facilities, equipment, or other resources to conduct specific research or development efforts that are consistent with the laboratory's mission.
Chit	A unit of resources used in the game in place of money.
DoD	Department of Defense
DOE	Department of Energy
GDP	Gross Domestic Product
Goal	A specific technology or product that you seek to develop and have available at a certain time in the future
IE	Industrial Ecology
IP	Intellectual property
Milestone	A technology-related subset of the goal; one of the critical path components required to achieve the goal.
NCRD	National Coalition for Research and Development - The National Coalition for R&D was created to foster industry, university, and federal lab alliances that will optimize the nation's R&D return. The NCRD focuses on facilitating three-way partnerships. The coalition was a spontaneous outgrowth from the Future of the DOE Labs Prosperity Game.
NFE	Non-federal entity
R&D	Research and Development
SBI	Small Business Initiative. SBIR - Small Business Innovation Research - A federally funded program to promote small business participation in government programs.
SNL	Sandia National Laboratories
TA	Technical Assistance
TeraFLOP	10^{12} floating point operations per second
TPC	Technology Partnerships and Commercialization Center at Sandia
WFO	Work for Others - Work performed by a laboratory or DOE facility for a non-DOE entity that is fully funded by the non-DOE entity.

INDUSTRIAL PARTNERSHIP PROSPERITY GAME^{TM} SCHEDULE

Wednesday, September 3, 1997	
4:00 pm	Participant registration and badging; collect materials; pre-game polling at team tables (web-based)
5:00 pm	Plenary Session: gather in Ballroom theater seating Welcome: Warren Siemens, Dan Hartley, John Crawford
5:30 pm	Prosperity Game briefing/overview with questions and answers (Marshall Berman - game director)
6:30 pm	Cash bar in pre-function area
7:00 pm	Dinner with team members and staff; get answers to questions
8:30 pm	Formal meeting adjourned. Private team meetings and discussions may continue

Thursday, September 4, 1997	
7:30 am	Breakfast buffet
8:00 am	*SESSION 1 (Sept. 1997): PLANNING* Set team ground rules; review challenges and technology areas; define technology goals and milestones
9:45 am	Team briefings in plenary session
10:45 am	Update planning; **submit planning document to Control Team by 11:30**
11:30 am	Lunch buffet
12:30 pm	*SESSION 2 (Jan. 1998): NEGOTIATION* Chits distributed; seek to accomplish goals through technology development, partnering; pursue desired changes in policy, process, and regulation
2:15 pm	SBD team assessment of key observations in plenary session
2:30 pm	Break
3:00 pm	*SESSION 3 (Jan. 2000): NEGOTIATION* Chits distributed; continue activities from Session 2
4:45 pm	AG team assessment of key observations in plenary session
5:00 pm	Formal meeting adjourned. Cash bar in pre-function area
5:30 pm	Dinner (open seating)
6:30 pm	End of day's activities Staff meeting

Friday, September 5, 1997	
7:30 am	Breakfast buffet
8:00 am	*SESSION 4 (Jan. 2002): DEBRIEF* Internal team debrief on specific questions; select spokesperson; polling at team tables
8:30 am	Team briefings in plenary session
9:30 am	*SESSION 5 (Jan. 2002): NEGOTIATION* Chits distributed; update planning if necessary, **submit planning changes to Control Team**; continue activities from Session 3
10:30 am	Break
10:45 am	SBD team assessment of key observations in plenary session
11:00 am	*SESSION 6 (Jan. 2004): NEGOTIATION* Chits distributed; continue activities from Session 5
12:30 pm	Lunch buffet; post-game polling at team tables (web-based) between now and 2:30
1:30 pm	AG team assessment of key observations in plenary session
1:45 pm	*SESSION 7 (Jan. 2006): DEBRIEF* Internal team debrief; teams digest game results and document best ideas and practices
2:30 pm	Town meeting in plenary session; open comment on specific questions
3:30 pm	Adjourn

INDUSTRIAL PARTNERSHIP PROSPERITY GAME^{TM} SESSION SUMMARY

TERMS OF PLAY	SESSION 1: PLANNING	SESSIONS 2-3 (1998-2001): NEGOTIATION	SESSION 4: DEBRIEF	SESSIONS 5-6 (2002-2005): NEGOTIATION	SESSION 7: DEBRIEF
TIME	*Thursday, 8:00-11:30 am*	*Thursday, 12:30-4:45 pm*	*Friday, 8:00-9:30 am*	*Friday, 9:45 am - 12:30 pm*	*Friday, 1:45-3:30 pm*
Definitions and staging information	• Players come prepared, having read handbook • Players' expertise and knowledge, along with assigned stakeholder roles set the stage for planning	• Teams make moves to accomplish goals • Resources are limited; moves require resources • Moves must be recorded on an Agreement Form	• After one day's play and a night's sleep, players reflect on game status	• As in sessions 2-3	• Composite outcome of all teams' plans and moves is important for final assessment
Team actions	• Form vision, define constituent interests, and posture vs. other teams • Develop rules, decision-making processes, define individual roles and responsibilities • Use handbook and expertise to define goals and milestones • Report on plans in initial briefing • Update plans based on information from briefing • Submit plans to Control	• Control Team distributes resources • Teams make moves to satisfy milestones. Generally, one move for one milestone: - Solo move - Partnership - License - Process or policy change - Other • Continuous scan for information from other teams	• Players individually answer poll on internal game web • Teams meet and answer specific questions posed by Control Team • Spokesperson reports to full group	• Control Team distributes resources • Teams may choose to update plans • Teams make moves to satisfy milestones. Generally, one move for one milestone: - Solo move - Partnership - License - Process or policy change - Other • Continuous scan for information from other teams	• Players individually answer poll on internal game web • Teams meet and answer specific questions posed by Control Team • Debriefing captured by game staff • Town meeting where any player can respond to questions posed by the Control Team
Relationship to other teams	• Strategies and objectives may be synergistic or antagonistic.	• Teams may partner or make solo moves • Teams may have influence over processes other teams must follow	• Report may reflect favorably or unfavorably on other teams	• As in sessions 2-3	• Reflection on relationships formed
Impact on game	• Play in pursuit of team goals and milestones determines outcome • Initial briefing allows teams to update planning based on current information.	• Moves determine the extent to which team goals are met by the players	• Composite snapshot of entire game results, feelings, rationales, etc. can cause major shifts in patterns of play	• As in sessions 2-3	• Points to follow-on activities to implement successes and address issues